Army Research Laboratory

Battlefield Environment Technology Transfer during Digital Capstone Exercise II

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NOTICES

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Abstract

During Digital Capstone Exercise (DCX) II, the 4th Infantry Division (4ID) employed the U.S. Army's first digitized heavy division enabled by modern warfighting doctrine, structure, and systems, such as the Army Battle Command System (ABCS). The division conducted full-spectrum operations in a simulated environment requiring dominant maneuver, precision engagement, full dimension protection, leadership, and focused logistics.   The objectives of DCX II were to (1) demonstrate warfighting capabilities, (2) demonstrate the integrated 4ID as the decisive element of the ground element in joint operations, (3) assess maturity of ABCS technologies, and (4) assess logistics support capability. DCX was a success for the U.S. Army Research Laboratory and the Integrated Meteorological System (IMETS). First, we demonstrated we could effectively inject synthetic weather into the Model of the Day database in the field and produce results desired weather effects in the Integrated Weather Effects Decision Aid matching the desired Battle Command Training Plan weather scenario. Second, the equipment and software performed without major malfunctions. Third, the 4ID Weather Cadre led the way in showing the complete integration of ABCS and IMETS functions in support of a digital customer.

Preface

During Digital Capstone Exercise II, the 4th Infantry Division (4ID) employed the U.S. Army's first digitized heavy division using the Army Battle Command System (ABCS). The division conducted full-spectrum operations in a simulated environment requiring dominant maneuver, precision engagement, full dimension protection, leadership, and focused logistics. The U.S. Army Research Laboratory (ARL), Project Director of the Integrated Meteorological System (IMETS) and the 4ID Weather Cadre successfully demonstrated the ability of IMETS to support the warfighter in a digitized battle environment. For the first time, using the *simwthr* techniques developed at ARL, we injected synthetic weather into the Model of the Day database in the field and produced the weather effects in the Integrated Weather Effects Decision Aid (IWEDA) matching the desired Battle Command Training Plan weather scenario. We observed the 4ID Weather Cadre lead the way in showing the complete integration of ABCS and IMETS functions in support of a digital customer.

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1. Introduction

The U.S. Army Research Laboratory (ARL) Battlefield Environment Division, Computational & Information Science Directorate provided Subject Matter Expert (SME) assistance to transition ARL environmental technology to the 4th Infantry Division (4ID) Combat Weather Teams during the Digital Capstone Exercise (DCX) II at Ft Hood, TX, 5–9 October 2001.

During DCX II, the 4ID employed the U.S. Army's first digitized heavy division enabled by modern warfighting doctrine, structure, and systems, such as the Army Battle Command System (ABCS). The division conducted full-spectrum operations in a simulated environment requiring dominant maneuver, precision engagement, full dimension protection, leadership, and focused logistics. Participating 4ID elements were dispersed on Ft Hood and at Brownwood and Brady, TX. The objectives of DCX II were to

1. Demonstrate warfighting capabilities.
2. Demonstrate the integrated 4ID as the decisive element of the ground element in joint operations.
3. Assess maturity of ABCS technologies.
4. Assess logistics support capability.

Opposing forces were represented by computer simulations at the Battle Simulation Center at Ft Hood and controlled by the Battle Command Training Program (BCTP) staff.

The Integrated Meteorological System (IMETS) is the focal point of current ARL environmental technologies supporting the digital Army. To effect this technology transfer during DCX II, ARL

- Provided SME assistance for ARL and Project Director(PD)-IMETS developed software used by Air Force Combat Weather Teams (CWTs) in support of the 4ID DCX.
- Provided over-the-shoulder guidance for new operators on new laboratory products such as the synthetic weather generator under field conditions.
- Evaluated and assessed quality, accuracy, and performance of ARL software under field conditions and provided feedback to laboratory scientists and software developers.

2. Technology Transfer Process

2.1 Exercise Success Stories

DCX was a success for ARL and IMETS. First, we demonstrated we could effectively inject synthetic weather into the Model of the Day database (MOD DB) in the field and produce weather effects in the Integrated Weather Effects Decision Aid (IWEDA) matching the desired BCTP weather scenario. Second, the equipment and software performed without major malfunctions. Third, the 4ID Weather Cadre led the way in showing the complete integration of ABCS and IMETS functions in support of a digital customer.

Throughout the exercise, we were able to use the ARL *simwthr* software to stimulate the desired exercise scenario weather and move the resulting MOD DB to the field sites. The weather teams and Tactical Operation Center (TOC) customers could then execute the IWEDA. This was the first time IMETS was fully used in a Corps Battle Simulation (CBS) war game. The only difficulties encountered were communications problems in ftp transfers of the database, which were resolved by the Network Operations Center as the exercise progressed. The Combat Arms Center Staff Weather Officer told us he wants us to use the ARL synthetic weather program to support future CBS events.

By spending time out with the weather teams, we were able to provide training to a new forecaster who, due to manning constraints, had very little IMETS experience. We also took the opportunity to work with weather personnel who had received training but needed a refresher on some of the techniques. Reinforcing this training while supporting a real customer added a dimension that cannot be achieved in the classroom setting.

The 4th Aviation Brigade (4BDE) CWT, previously trained by ARL, achieved a real ARL/IMETS success story in the field. They skillfully used both the ABCS capabilities and the ARL synthetic weather produced on the IMETS. Using inputs from the Tactical Airspace Integration System, Air & Missile Defense Work Station (AMDWS) and Maneuver Control System, the 4BDE CWT depicted the battlefield picture and instructed the TOC customers how to invoke and use the exercise weather depicted on IWEDA. Their efforts exemplify exactly how IMETS can be used to support the digitized Army (fig. 1) The 4BDE CWT are to be commended for taking the initiative to coordinate with their ABCS counterparts to pull the battlefield geometries, air corridors, air tracks, and live blue and red forces into the IMETS display to track the course of the battle. Weather products were then tailored in response to the flow of battle. This is exactly how IMETS should be used to fulfill its ABCS role. This synergism of ABCS products cannot be achieved in the laboratory or classroom because they do not have the full complement of ABCS components assembled in a TOC local area network. Assessing how these elements all came together in a field setting was not only rewarding but also provided customer feedback and suggested improvements for the laboratory.
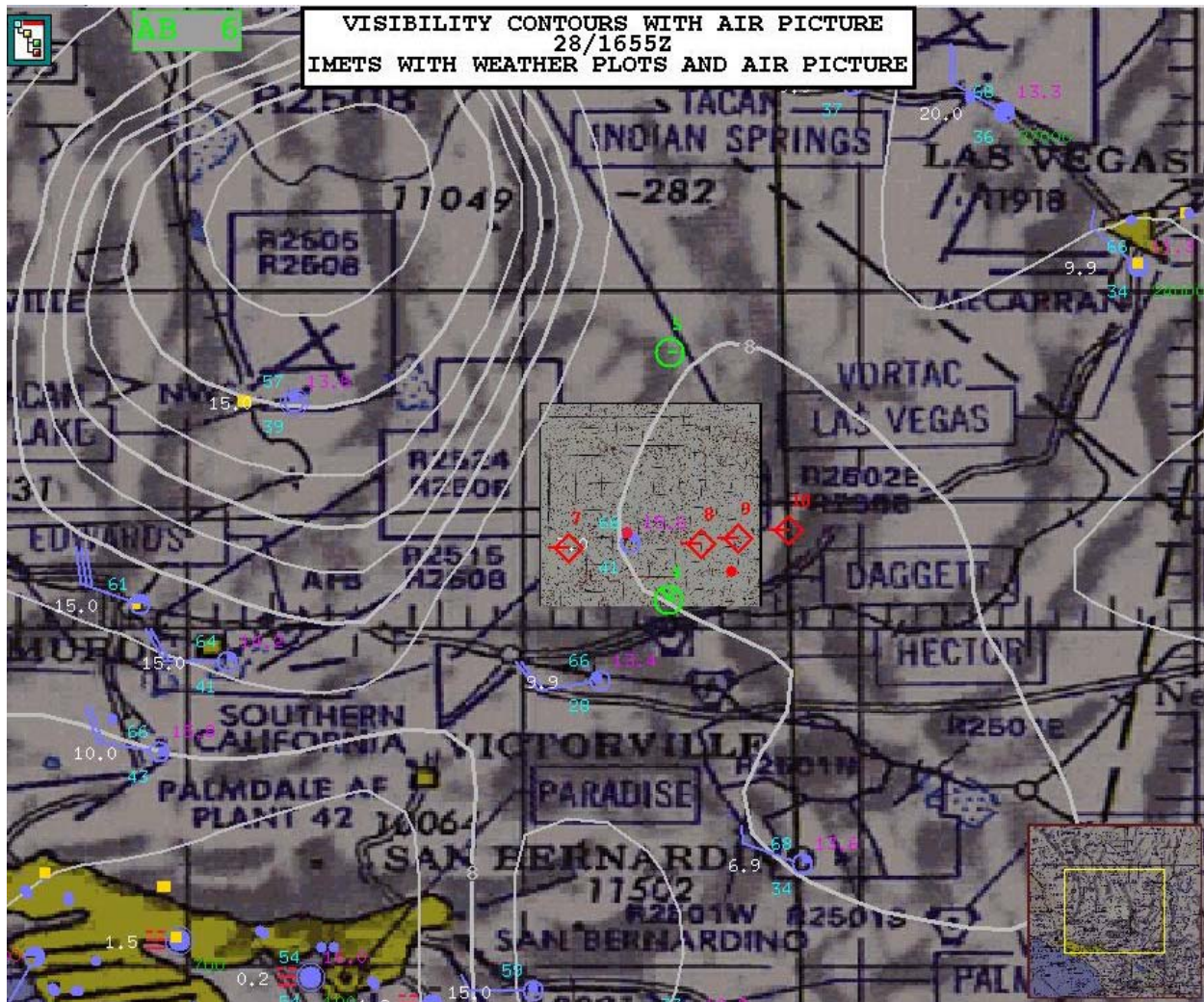
Figure 1. IMETS weather overlay of visibilities over the Air Picture from the AMDWS.

2.2 Exercise Lessons Learned

On the day we had an outbreak of rain and thunderstorms, 4BDE made a valiant effort to use the Weather Feature application to issue the warning on their IMETS. They created a warning box and the alerts appeared on some of the workstations in the TOC. However, in some cases, the warnings could not be viewed after using the Weather menu button. ARL needs to correct and evaluate the Feature Weather Application in a TOC environment.

A problem was observed at 4BDE with the synthetic weather database after creating an area of interest (AOI) over Texas for local weather and running the BFM (battle forecast model). When they attempted to invoke IWEDA from the exercise MOD DB over Bosnia, the map area would keep going back to the Texas AOI. The IWEDA matrix would come up, but when attempting to go to the map area, it would always revert to Texas. ARL needs to correct this problem so both exercise and local weather can be run simultaneously for resource protection.

The manning problem is acute throughout Air Force Weather Agency. This is affecting the performance of the teams because they cannot effectively train or field adequately manned field teams. Fortunately, for this type of exercise they did not need observers. To help in this area, ARL and PD IMETS need to push hard to get the automated weather sensors and data feed incorporated into IMETS to alleviate the observer shortfall.

We have many recommendations for synthetic weather program improvement. One helpful addition to IWEDA would be a section in the Systems/Missions window for "BCTP Exercises." New choices might be helicopter operations, close air support, air interdiction, and so on (i.e., operations matching the scenario operations). Wargame customers then would be able to select those operations valid for the exercise.

One problem with the synthetic weather program is that if you make certain systems show red or yellow in the IWEDA matrix, it renders the Contours program unusable. For example, if you use winds over 25 m/s over the area to ground the unmanned aerial vehicles, it shows these strong winds all over the area on the Contours program, rendering smoke unusable. We recommend disabling the Contours program during canned weather exercises and have only IWEDA and Weather Feature operative. As a result, the customers could use IWEDA and the weather teams could issue warnings and forecasts with Weather Feature matching exercise weather.

We had an excellent discussion regarding division weather support with the 4ID Staff Weather Officer (SWO). He explained the difficulties in supporting both the exercise weather requirements while monitoring local weather to protect resources. He said part of the reason the teams are dependent on the Non-secure/unclassified Internet Protocol Router Network (NIPRNET) for real-time products is due to training shortfalls. He said the teams need more training so they are more aware of what the IMETS can do. This is particularly true as new software rolls out of the laboratory with IMETS update. We suggest the teams should be using the tactical very small aperture terminal and IMETS for exercise and local weather support. We further recommend the 4ID SWO identify those products readily available on the NIPRNET that were needed/useful but could not be produced on the IMETS (e.g., radar loops). These recommendations will be presented to ARL for new developments and improvements.

Bibliography

Briefing, Planning Guidance from CG TRADOC, 29 Jun 01. (UNCLASSIFIED)

Kyle, A. "Digital Capstone Exercise I, Integrated Meteorological System Concept of Operations, Tactics, Techniques and Procedures, 2 Mar 01. (UNCLASSIFIED)

Abbreviations and Acronyms

4BDE	4th brigade
4ID	4th Infantry Division
ABCS	Army Battle Command System
AMDWS	Air & Missile Defense Workstation
AOI	Area of Interest
ARL	Army Research Laboratory
BCTP	Battle Command Training Program
CBS	Corps Battle Simulation
CWT	Combat Weather Team
DCX	Digital Capstone Exercise
IMETS	Integrated Meteorological System
IWEDA	Integrated Weather Effects Decision Aid
MOD DB	Model of the Day Database
NIPRNET	Non-secure/unclassified Internet Protocol Router Network
PD-IMETS	Project Director IMETS
SME	Subject Matter Expert
SWO	Staff Weather Officer
TOC	Tactical Operations Center

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